HARVARD COLLEGE OBSERVATORY

HARVARD UNIVERSITY

NASA Grant NsG 89-60

MULTICOLOR PHOTOELECTRIC PHOTOMETRY OF THE MOON, VENUS, MARS, AND OTHER PLANETS.

SEMIANNUAL STATUS REPORT NO. 11

July 1, 1965 to December 31, 1965

Project Director: Donald H. Menzel

Current Research:

The observational part of the project has now been concluded. Planetary observations continued on a routine basis at the Le Houga Observatory in France until their termination December 17, 1965. The photometer and related equipment at this observatory are now in shipment back to the United States. Observations also continued on a routine basis at the Boyden Observatory in South Africa until their termination at the end of December, 1965. Return of the equipment from South Africa has been temporarily delayed pending possible use by Professor A. van Hoof of the Leuven Observatory.

Reduction of the observations is proceeding routinely in Cambridge with the current emphasis on culling out bad observations and determination of a standard system of magnitudes, to which all observations may be reduced.

As a first step in publication of the observational results, a paper describing the instrumentation and data reduction methods used is in preparation.

Theoretical calculations of light scattering and radiative transfer in planetary atmospheres are continuing as described in the previous semiannual status report. A study was made of the "shadowing" correction to radiative transfer theory applicable for diffuse reflection by layers of large particles; this work may be relevant to Saturn's rings and/or the lunar surface. Dr. W. M. Irvine presented a paper on scattering cross-sections of ice spheres, possibly relevant to the Venus atmosphere, at the Symposium on Meteor Orbits and Dust, Smithsonian Astrophysical Observatory, Cambridge, Massachusetts, August, 1965. Dr. Irvine participated in the December meeting of the American Astronomical Society, held jointly with the American Association for the Advancement of Science, in Berkeley, California.

Publications of project-sponsored work by Dr. Irvine during the period of this report were:

1) "Multiple Scattering by Large Particles," Symposium on Radiation Processes in the Atmosphere (Leningrad 5-12 August 1964). IUGG Mono. No. 28, 11, 1965 (Abstract).

2) "Multiple Scattering by Large Particles," Astrophys. J., 142, 1563, 1965.

3) "The Distribution of Photon Optical Paths in a Scattering Atmosphere," Astron. J., 70, 679, 1965 (Abstract of paper presented at the August 1965 meeting of the American Astronomical Society, Ann Arbor, Michigan).

Future Plans

The observational data promise to provide the most complete information heretofore available on the albedos and phase curves for the brighter planets. Adequate utilization of this data for the determination of atmospheric and surface properties will require the development of new theoretical methods, as well as the full use of existing methods. A proposal is now being prepared for the extension of the present grant for the purpose of carrying out such theoretical investigations.

Dr. Irvine will present an invited paper at the Symposium on Interdisciplinary Aspects of Radiative Energy Transfer, to be held in Philadelphia, February 24-26, 1966.

Personnel

Mrs. Marie Bocchino transferred to full-time work as of September 1, 1965.

Mrs. Carol Mohnkern was employed by the project on December 2, 1965 as Secretary-Junior Research Assistant.

Mr. Theodore Simon, a graduate student in astronomy at Harvard, concluded work on the project on November 29, 1965.

Property

Major items of equipment (over $1000) will be reported separately by the Harvard University Office for Research Contracts.